

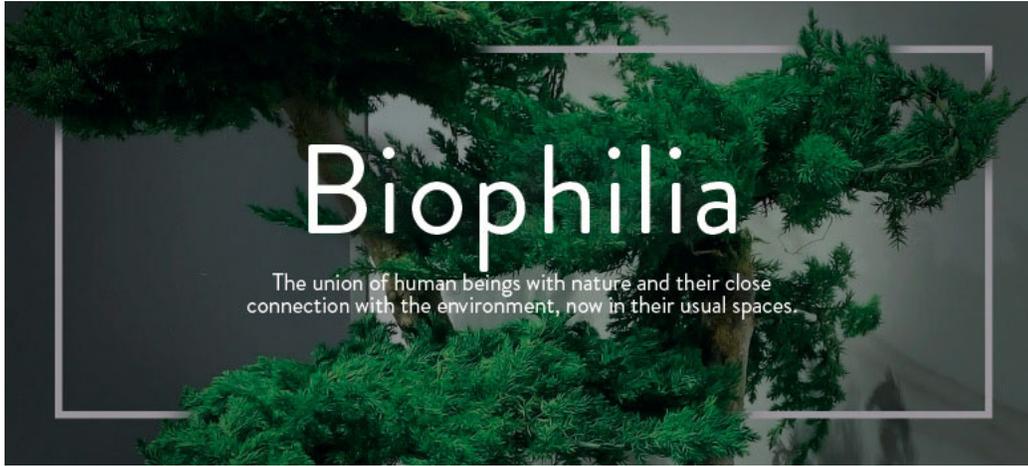
From Stress Relief to Sustainability

Communicating the Benefits of Plants

Melinda Knuth, Ph.D.
North Carolina State University

MelindaKnuth@ncsu.edu





Biophilic design



80% of Americans live in urban areas

90-93% of an average American's day is spent indoors



We commonly communicate our products' value by aesthetics or features



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Growing Healthier Together: The Benefits of Gardening for Body and Mind

By Elena Huffman | August 5, 2025

Study Shows Plants And Green Décor In Hospital Rooms May Aid Stress Recovery

Researchers use immersive VR to understand how different visual elements in hospital rooms affect relaxation and cognitive restoration in patients experiencing acute stress.

Jun 27, 2025 | By Lesley Henton, Texas A&M University Division of Marketing and Communications | 4 min. read

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LIFESTYLE

Is "Forest Bathing" the Cure to Burnout? Here's My Honest Review

"Being in nature not only made me feel calmer, but also made me identify areas in my life that aren't serving my needs."

BY SHADÉ OWOMOYELA | PUBLISHED: JAN 12, 2026

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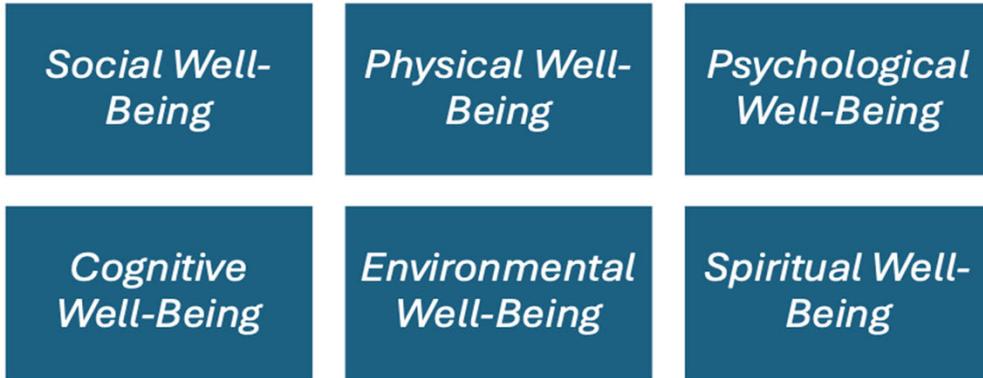
HOME-GARDEN

Plant care is especially important during Wilmington's winter months

Kadence Baumgardner Guest contributor
Jan. 23, 2026, 5:03 a.m. ET

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Quality of Life Metrics



WHO, 2012, WHOQAL



Quality of Life Metrics are areas in which we can insert plants



Benefits instead of Features

What it does

Features =

- Water bottle is blue
- It holds water
- Keeps water cold



Benefits =

- Blue is my favorite color
- Staying hydrated helps me think clearly
- I like cold water; it is refreshing



Greater Happiness

- Boost mood and self-esteem
- Reduce anger
- Moving to a home with more greenspace improves mental health (Alcock et al. 2014)



Greater Life Satisfaction



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- **Improve general psychological wellbeing** (Barton and Pretty 2010, Keniger et al. 2013, Mensah et al. 2016, Windhager et al. 2011, Wolf and Housley 2014)
- **Greater species diversification positively affects personal and neighborhood well-being** (Dallimer et al. 2012; Luck et al. 2009)



Reduced Anxiety and Stress

- **Reduce mental fatigue recovery time**
- **Improve concentration** (Entrix 2010, Keniger et al. 2013, Kjellgren and Buhrkall 2010, White et al. 2017, Wolf and Housley 2014)
- **Lower cortisol (stress hormone) levels** (Alvarsson et al. 2010, Bowler et al. 2010, Park et al. 2016, Park et al. 2017, Russell et al. 2013)



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Reduced Anxiety and Stress

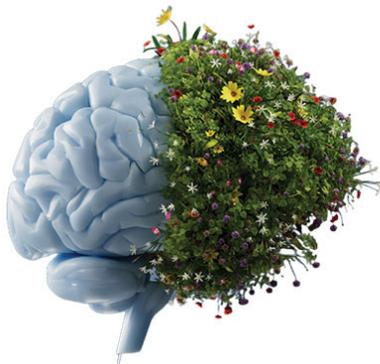
- Hospitalized patients perceive experience lower stress symptoms (Beukeboom et al. 2012)
- Women have greater decreased stress than men (Roe et al. 2013)
- Less heart rate variability (Callaghan and Mallory-Hill 2016, Ikei et al. 2014, Ikei et al. 2013, Smith and Pi 2011)



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Enhanced Memory Retention



- 20% improvement on working memory test (Berman et al. 2012)
- Increased memory retention with dementia and stroke patients (Detweiler and Warf 2005)
- Greater cognitive development and lower inattentive-ness with children (Dadvand et al. 2015)
- Improved cognitive capacity and lowered aggressiveness with dementia patients (Gigliov and Jarron 2005)

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Enhanced Productivity and Attention



- Biophilic work environments can lead to greater productivity and attention with employees (Elzeyadi 2011, Windhager et al. 2011)
- Employees in biophilic room completed concentration task 19% faster than employees in room without a view (Nieuwenhuis et al. 2014)
- 97% of employees would like more plants in the workplace (Hus et al. 2015)

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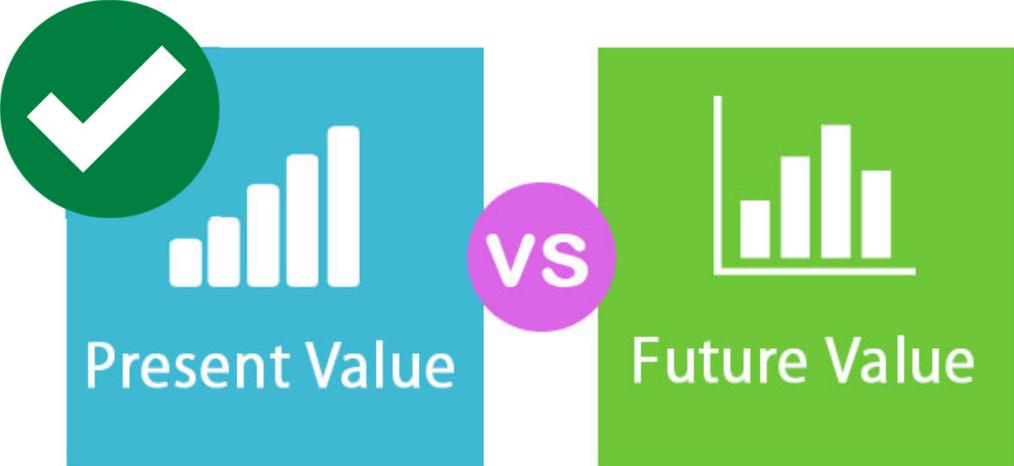
Mitigation of PTSD

- Veterans treated with Nature Adventure Rehab. had improved post-traumatic cognitive inventory (Gelkopf et al. 2013)
- Victims of natural disaster treated with hort. therapy had increase in regional gray matter volume (Kotozaki et al. 2015, Sekiguchi et al. 2015)
- Increased cortisol (stress hormone) and alpha amylase levels which are diminished in PTSD victims (Kotozaki 2014, Kotozaki et al. 2015, Sekiguchi et al. 2015)



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Present Value

VS

Future Value

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How to use this information

- Focus on what the products can do for the consumer
- Clear, short statements with simple vocabulary:
 - Being near plants can help your brain recover quicker
 - Having plants in your office can make you more productive
 - Living in a neighborhood with many plants, like trees, can lead to a greater life satisfaction as compared to living in a neighborhood with little to no plants
 - Gardening can heal PTSD symptoms with veterans and victims of natural disaster
- Benefits that can immediately impact consumers' lives are taken more into consideration than futuristic benefits.

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Environmental Benefits of Plants

Thank you to HRI for funding!



Areas of Environmental Benefits



Noise Reduction and Air Quality Improvement



Soil and Remediation



Light, Water, and Temperature



Carbon Sequestration



Environment Ecosystem Services





Air Quality Improvement

- Urbanization and deforestation are the two leading causes of global air quality regression
- Street trees capture **CO2 from vehicle emissions and buildings** (Li et al., 2016)
- Street trees **capture particulate matter** carried in the air by the surface of the leaf and absorbed into the plant (Velasco et al., 2016)



Biodiversity is key to air quality remediation

Przybysz et al., 2014

Moss and Lichen

- Frequently used for remediation (Szczepaniak & Biziuk, 2003)
- Absorb heavy metals in the air (Szczepaniak & Biziuk, 2003)
- Great for locations where vascular plants have difficulty growing

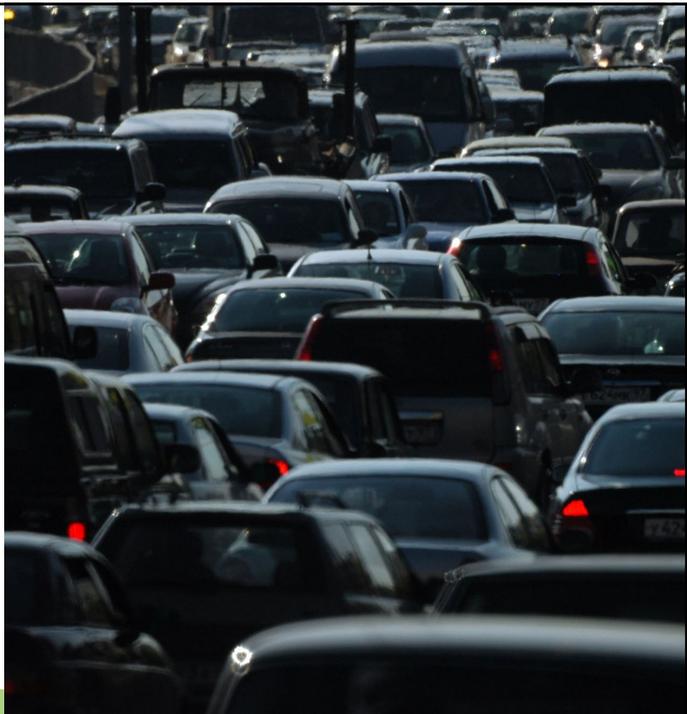
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Noise Pollution

- Listening to noise above **70 decibels** for an extended period can be hazardous (Jariwala, 2017)
 - Cars, sirens, people, music, and countless other sounds
- Tree bark absorption, green roofs, living walls, shrub barriers
- Can filter out **5-10 decibels of sound** (Oquendo-Di Cosola et al., 2022)

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Soil

Erosion of shorelines and coastal, stream banks, stormwater management, cover crops (Bledsoe, 2002; De Baets et al., 2011; Gyssels et al., 2005; Hunolt et al., 2013; Huxham et al., 2018)



Soil

Fertility of nutrient levels and structure (Decker et al., 2022; Gyssels et al., 2005; Sylvian & Wal, 2011; Pan et al., 2023)

- Cover crops create biomass
- Deep tap roots to break subsoils
- Legumes fix nitrogen
- Microbe diversity



Remediation

- Contamination of heavy metals, excess nutrients, municipal waste products
- Phytoaccumulation (Bacchetta et al., 2015)
 - Sunflowers
 - Regional native plants
- Preservation of microbiome (Basirat et al., 2019)
 - Rhizobia
- Nutrient uptake (Bedair et al., 2022)
 - Phytovolatilization, phytoextraction, phytodegradation

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Water

- Urban: reduces porous surface area for water to absorb into the ground and even where there is the opportunity for absorption
- Non-Urban: fertilizers, manure from animals, or pesticides residues

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Water

Rain gardens and bioswales remediate (Yang et al., 2013)

Rain gardens capture up to 49% of fertilizer contaminants; 70% heavy metal contaminants (Li et al., 2016)

Wetlands to maintain stormwater and reduce risk and damage of flooding (Kumar et al., 2021)

Aquatic plants are excellent habitats for fish, birds, and mammals (Sharma & Malaviya, 2021)



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Temperature / Light

- Thermoregulation through biodiversity
 - Urban Heat Island effect (Taleghani, 2018)
- Trees reduce urban environments by 9 degrees in urban and 5 degrees in suburban areas (Ramesh, 2016)
- Green walls through evapotranspiration (Teotónio et al., 2021)
- Ultraviolet radiation (UVR)
 - Reflection and absorption (Acosta & Evans, 2000; Biesalski & Obermueller-Jevic, 2001)

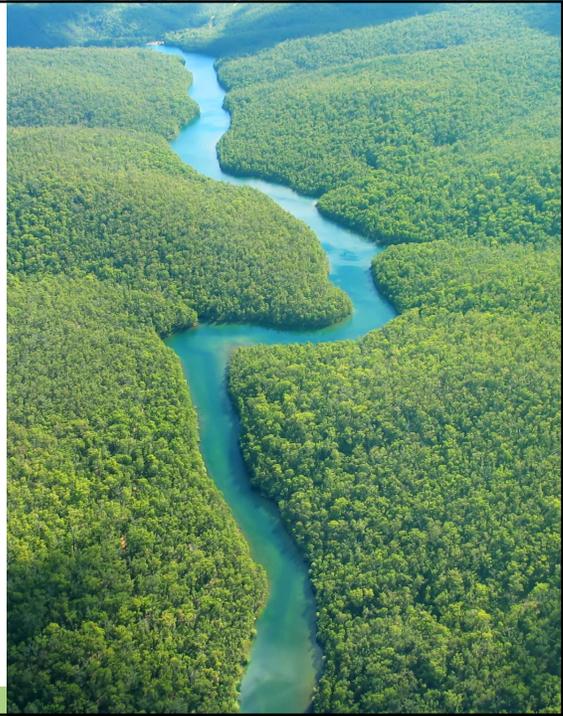


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Carbon Sequestration

- Forests and woodlands
 - Soil carbon account for 85% of carbon storage
 - Temperate forests 50-60% of total carbon storage (Lal, 2005)
- Mosses
 - Live in areas that vascular plants struggle (Serk et al., 2021)

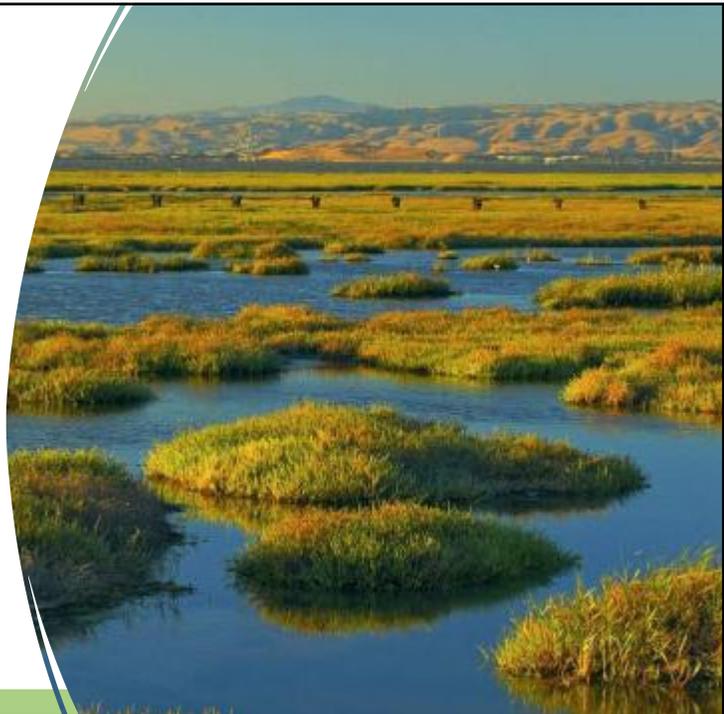
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Carbon Sequestration

- Wetlands
 - Green (in-plant) and blue (in water) sequestration (Euliss et al., 2016)
 - Account for 33% of terrestrial carbon storage
 - Offset up to 3% of NA annual emissions

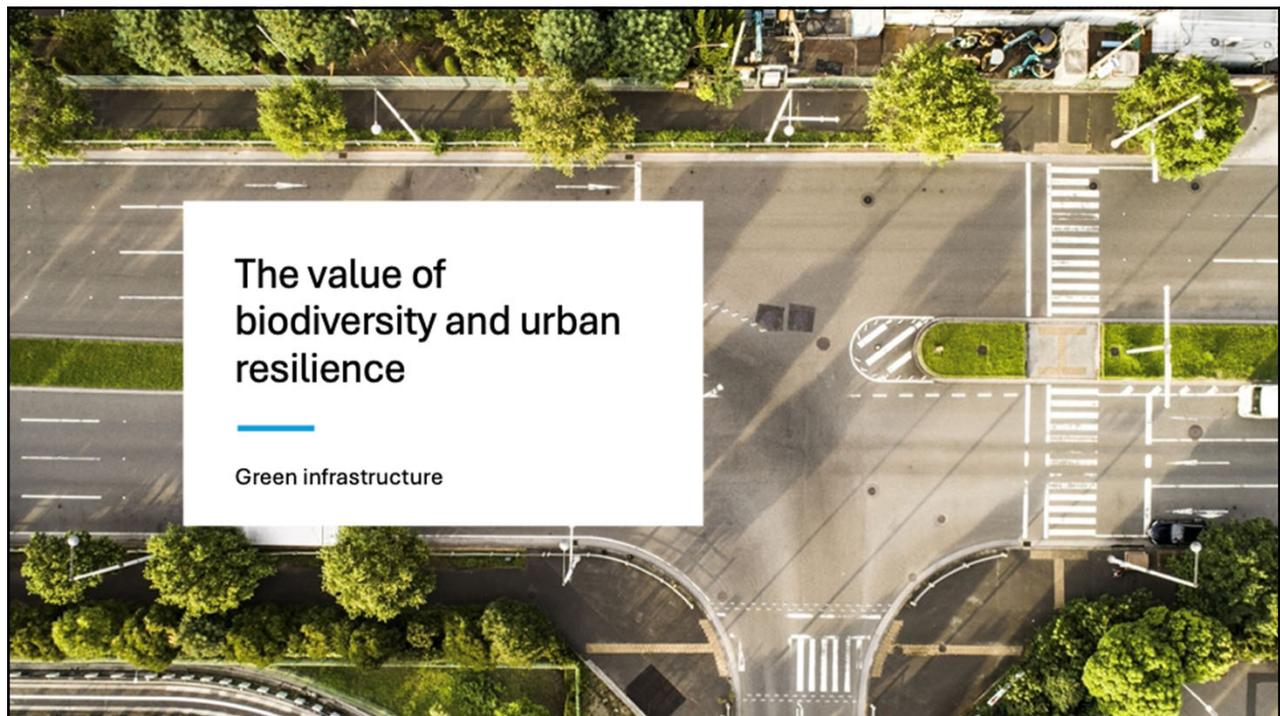
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Carbon Sequestration

- **Grasslands** (Basu et al., 2021; Sylvian & Wal, 2011; Richter et al., 2021)
- **Algal Forests and Seagrass**
 - 70% of marine carbon sequestration; 2:1 ratio (Duarte et al., 2018; Singh & Ahluwalia, 2013; Macreadie et al., 2014)

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The value of
biodiversity and urban
resilience

Green infrastructure

Not a set of well known benefits in the news



How to use this information

- Focus on what the products can do for the consumer
- Use clear, short statements with conversational words:
 - Grasses are a great sink for carbon storage
 - Tree leaves are excellent at absorbing light energy and reducing the temperature in the area around it
 - Shrubs and trees can absorb sound in urban and suburban areas by 10 decibels; reducing noise pollution
 - Street trees capture particles in the air on their leaves improving air quality
- Benefits that can immediately impact consumers' lives are taken more into consideration than futuristic benefits.



Research on Benefits of Plants Messaging



JOURNALS AUTHOR INFORMATION FAQs ADVERTISERS ASHS HOME ABOUT ASHS STORE



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Effects of Benefits Messaging on Consumer Purchasing of Plants

Authors: Melinda J. Knuth, Bridget K. Behe, Alicia Rihn, and Charles R. Hall
Click on author name to view affiliation information

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Table 1.

Conjoint design attributes and levels as part of an online survey of consumers to assess plant benefit messaging on consumer attitudes and likelihood to buy.

Attribute	Levels
Price (per plant), \$	9.99 19.99 29.99
Availability	Commonly available Moderately available Rarely available
Type of plant	Flowering Foliage Herb Succulent

Knuth et al., 2023



Benefits¹

Physical benefit	Outdoor walks where plants grow lowers blood pressure in adults and contributes to improved physical health.
Emotional benefit	Being near plants can provide a sense of relaxation and reduced stress.
Cognitive benefit	Being in the vicinity with plants can improve your concentration and memory.
Aesthetic benefit	Many plants create an artistic dimension to the home and garden, pleasing to the eye.
Economic benefit	Every \$1 invested in the home landscape returns \$1.09 to \$1.15 to the homeowner.
Social benefit	Plants help create a comfortable environment where people can meet and socialize.
Environmental benefit	Plants provide numerous environmental benefits, including cleaner indoor air and outdoor pollinator habitats.
Education benefit	Engaging in plant activities can help people learn about scientific concepts, including plant growth and growing your own food.

Knuth et al., 2023



Messages

Physical: Outdoor walks where plants grow lowers blood pressure in adults and contributes to improved physical health.

Emotional: Being near plants can provide a sense of relaxation and reduced stress.

Cognitive: Being in the vicinity with plants can improve your concentration and memory.

Aesthetic: Many plants create an artistic dimension to the home and garden, pleasing to the eye.



Messages

Economic: Every \$1 invested in the home landscape returns \$1.09 to \$1.15 to the homeowner.

Social: Plants help create a comfortable environment where people can meet and socialize.

Environmental: Plants provide numerous environmental benefits including cleaner indoor air and outdoor pollinator habitats.

Educational: Engaging in plant activities can help people learn about scientific concepts including plant growth and growing your own food.



Table 5.

Relative importance and part-worth utility values for eight benefits messages derived from an online consumer behavior study plant purchases on the attributes price, availability, and type of plant.

	Total (N = 1010)	Physical Mean (SD)	Emotional Mean (SD)	Cognitive Mean (SD)	Aesthetic Mean (SD)	Economic Mean (SD)	Social Mean (SD)	Environmental Mean (SD)	Educational Mean (SD)
Price	35.15 (17.24)	36.04 (0.23)	35.32 (0.20)	34.49 (0.20)	34.18 (0.18)	32.55 (0.19)	34.94 (0.16)	37.26 (0.22)	36.34 (0.22)
Availability	28.40 (12.88)	27.76 (0.16)	28.65 (0.15)	30.15 (0.16)	27.73 (0.14)	28.71 (0.15)	28.68 (0.14)	26.12 (0.15)	29.26 (0.16)
Type	36.45 (18.18)	36.19 (0.25)	36.03 (0.19)	35.31 (0.21)	38.10 (0.21)	38.73 (0.23)	36.38 (0.18)	36.62 (0.24)	34.40 (0.20)

Largest value on price of plant are those who saw the health benefits messages

Type of plant most important to people who say the economic and aesthetic messages

Knuth et al., 2023



	Total (N = 1010)	Physical	Emotional	Cognitive	Aesthetic	Economic	Social	Environmental	Educational	F	P value
		Mean (SD)									
Availability											
Common	0.10 (1.06)	0.16 a (0.01)	0.30 a (0.01)	-0.03 b (0.01)	-0.12 c (0.01)	0.06 b (0.01)	0.32 a (0.01)	-0.01 b (0.01)	0.12 b (0.01)	2.340	0.126
Moderate	0.03 (2.50)	-0.11 c (0.03)	0.05 b (0.04)	0.48 a (0.03)	0.18 a (0.02)	0.10 a (0.03)	-0.56 c (0.03)	0.42 a (0.03)	-0.36 c (0.02)	86.630	0.000
Rare	-0.13 (2.05)	-0.05 b (0.02)	-0.35 c (0.03)	-0.45 c (0.02)	-0.06 b (0.02)	-0.16 c (0.02)	0.23 b (0.02)	-0.42 c (0.03)	0.24 a (0.02)	146.940	0.000


Largest value on price of plant are those who saw the health benefits messages




What we know resonates well with consumers

- Consumers are willing to pay more for plants that have a benefits message rather than a features message
- Pairing commonly available plants with physical, emotional, and social messages is effective
 - Top five annual species
- Pairing moderately available plants with cognitive, aesthetic, and economic messaging
 - 'Lemon Meringue' *Baptisia*

Communication Examples



Benefits of healthy plants

- 1 Provide nutritious food
- 2 Improve soil fertility
- 3 Supply clean air and water
- 4 Help mitigate climate change
- 5 Protect biodiversity

Food and Agriculture Organization of the United Nations

Benefits of Urban Trees

- Reduces rates of cardiac disease, strokes and asthma
- Reduces Air Pollution by Filtering Particulate Matter
- Protects Biodiversity by Providing Habitat
- Increases Physical Activity
- Supports Stormwater Management
- Supports Social Cohesion
- Reduces Stress

Moving Towards Tree Equity
Many studies have found that trees are not equitably distributed throughout our cities and towns, with areas of majority Black, Indigenous and other frontline communities experiencing

5 BENEFITS OF PLANTING TREES

TREES HELP...

- 1 COMBAT CLIMATE CHANGE: absorbs carbon dioxide, converts it to oxygen.
- 2 PROVIDE SHADE & SHELTER: Trees provide shade and shade from the heat and cold.
- 3 CLEAN THE AIR: Through photosynthesis, trees produce oxygen. They remove particulate matter, reducing overall air pollution.
- 4 PREVENT FLOODING: Trees along river banks help soak excess water and keep soil in place.
- 5 IMPROVE MENTAL HEALTH: Studies show being near trees can reduce stress levels by decreasing your blood pressure and slowing your heart rate.

omni CALCULUS





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